

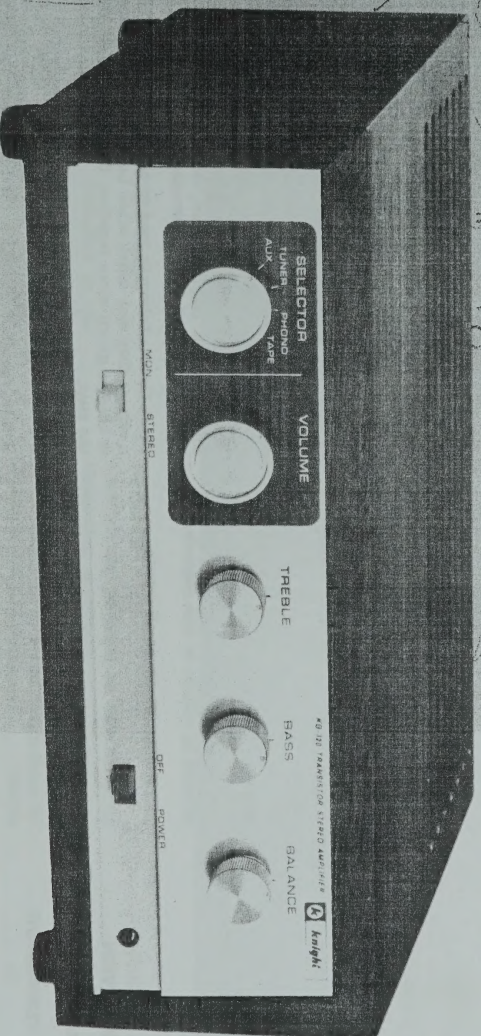
KNIGHT-KID

STYLED AMP

KG-320



knight-kit



Beautifully styled and fully transistorized, this 32-watt stereo amplifier will give you magnificent performance to provide you with years of listening pleasure. Low cost and compact, the KG-320 amplifier offers many fine features as instant and cool operation, freedom from microphonics, balance control for individual adjustment of the speakers and master volume control for overall volume adjustment. To accommodate your other equipment, the amplifier has 4 pairs of inputs controlled by a convenient front panel selector. A stereo-mono switch provides choice of mono-phonics or stereophonic operation. For better tape recordings, the recorder output jacks are independent of volume and tone settings. You will be proud to own this sturdy, compact transistor amplifier, constructed on a heavy-gauge aluminum chassis for strength and light weight. A specially engineered printed circuit board insures ease of construction and fine laboratory performance. To enhance the beauty of your room, a choice of separate cabinets is available in hand-rubbed oiled walnut or attractive metal. Instructions are furnished for custom mounting, if you prefer.

KG-320

**32-WATT TRANSISTOR
STEREO AMPLIFIER**

SPECIFICATIONS

POWER OUTPUT

IHFV power. 32 watts at 80, 30 watts at 160.
Continuous sine wave power. 20 watts at 80. 18 watts at 160.

FREQUENCY RESPONSE

± 1 db from 25 to 18,000 cps at rated output.

HARMONIC DISTORTION

Less than 1% at rated output.

HUM (phono input)

65db below rated output.

INPUT SENSITIVITY

tape head
phono
tuner
aux 1
aux 2

2.5 mv
3 mv
400 mv
300 mv
800 mv

OUTPUTS

500 mv at recorder outputs. Unaffected by volume or tone controls.

CROSS TALK

Better than 35 db at all inputs.

POWER CONSUMPTION

10 watts with no input signal.

POWER REQUIREMENTS

110-125 volts, 60 cycle

TRANSISTOR COMPLEMENT

10 small signal and 4 power transistors

DIMENSIONS

10" x 8 1/2" x 3 1/8"

WEIGHT

6 1/2 lbs.

CONSTRUCTION HINTS

UNPACKING

- Check the contents of your kit against the parts list at the back of the book. This will help you become acquainted with the parts. If you are not familiar with electronic components, the parts can be identified by comparing them with the wiring illustrations or the parts identification chart.
- Assort hardware by size when you check your parts. If you cannot determine the screw sizes, the hardware can be compared with the parts identification chart. The hardware is shown to actual size.

HELPFUL CONSTRUCTION HINTS

This book uses some symbols to give the value of the parts. "Ω" means ohms, "K" means one thousand ohms, "meg" means one million ohms, "μf" means microfarad and "μμf" means microfarad.

The only tools needed to build the transistor amplifier are a soldering iron rated 40 to 100 watts, long-nose pliers, diagonal cutters and a screwdriver.

The step-by-step instructions must be followed exactly. Do not attempt to wire this kit from the pictorials or schematic diagram alone because a definite wiring sequence must be followed. Occasionally, several parts are mounted with the same hardware, so be sure to read the entire step. For your convenience, a box is provided to check off each step after you have completed it.

Make good mechanical connections at solder points, clean metal to clean metal. Loop wires around terminals and clamp tightly.

To mount a resistor or capacitor, pull the leads through the terminals so the part is tightly mounted. Bend each lead around the terminal and cut off the excess wire.

Several types of wire are supplied. It is important to use the type called for in the step. Insulated wire, identified by color, has been cut to length and prestripped for your convenience.

Black flexible tubing is used to cover bare wires or leads where there is a chance they may touch other bare wires or the chassis. The red tubing is used to group wires together. Be sure to select the type called for in the step.

HOW TO CARE FOR YOUR SOLDERING IRON

Before you start to solder, carefully clean the tip of your iron with a fine file or steel wool until the bright metal surface of the tip is exposed. Heat the iron; then cover (tin) the tip with a thin layer of ROSIN CORE SOLDER. While the iron is hot remove excess solder from the tip with a clean cloth and re-tin the iron. When the tip of the iron becomes covered with a dull, oxide film wipe the tip with a clean cloth, and re-tin the iron.

IMPORTANT WIRING INSTRUCTIONS

CONNECT means: Connect the wire or lead to the terminal specified. Make a firm mechanical connection, BUT DO NOT SOLDER AT THIS TIME. Later, other wires will be connected to that terminal.

SOLDER means: Connect the wire or lead to the terminal specified; then solder that wire and all other wires that are connected to that terminal. If there is more than one wire to be soldered, the number of wires will be indicated in parenthesis. Example: Solder a red wire to terminal 3 of R-1 (4 wires). This means that four wires should be connected to terminal 3 when you solder it.



STEREO SYSTEM GUIDE

The information contained on the following pages will familiarize you with the operation of your amplifier and acquaint you with the many functions it must fulfill — as the “heart” of your sound system. The time you spend will be well rewarded by many useful hints on how to get the most out of your stereo system.

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DESCRIPTION OF CONTROLS

CONNECTING EQUIPMENT

SELECTOR

Determines the signal source that will be reproduced in the amplifier.

VOLUME

Governs the listening level of both left and right speakers to the same degree. A clockwise rotation increases the sound at both speakers.

TREBLE

High frequency tone control for both channels.

BASS

Low frequency tone control for both channels.

BALANCE

Controls the relative volume of the left and right speakers. A clockwise rotation decreases the listening level of the left speaker. A counterclockwise rotation decreases the listening level of the right speaker. The center position provides approximately equal volume for both speakers.

MON-STEREO

In the MON position, any monophonic or stereo signal will be heard monophonically from both speakers. In the STEREO position, stereo signals will be reproduced stereophonically.

OFF-POWER

Controls the AC power to the amplifier and AC receptacles.

GENERAL RULES

1. *Always use shielded cables* to connect program-source equipment to the amplifier input jacks. This also applies when connecting the REC output jacks to a tape recorder.
2. *Always turn the amplifier power off* before connecting equipment to, or disconnecting equipment from the amplifier. If the amplifier power is on when pin plugs are removed from the input jacks, strong hum voltages will be produced which may overdrive the speakers or amplifier.
3. *Because the amplifier generates very little heat*, ventilation requirements are easily met. The circulation of air provided by the spacing under the amplifier is sufficient. Do not place the amplifier on top of a radiator.
4. *Try not to locate your record player more than ten feet* from the amplifier. Excessive cable lengths can contribute to hum pickup and/or loss of high frequencies.
5. *Always use heavy gauge wire for connecting speakers*. Ordinary eighteen-gauge lamp cord is good for this purpose. If the amplifier is located a long way from the speakers, a heavier gauge wire is recommended.

CONNECTING EQUIPMENT TO YOUR AMPLIFIER

PHONO EQUIPMENT

If you have a low output stereo cartridge, connect the cables to the PHONO input jacks. If you have a high output stereo cartridge, (many ceramic and crystal cartridges have high outputs) connect the cables to the input jacks of AUX 1.

If you don't know what the output of your cartridge is, connect the cartridge to the PHONO inputs of the amplifier and play a record through the sound system. If the sound that you hear is extremely loud and distorted at a minimum setting of the volume control, you have a high output cartridge. This cartridge should be connected to the input jacks of the AUX position. If, however, the sound is clean and undistorted regardless of the volume control setting, you have a low output cartridge and it should remain connected to the PHONO input jacks.

If you are using a monaural cartridge, plug the single cable into either the L or R jack of the proper input.

NOTE: THE AUX 2 input jacks are used for program-source equipment having outputs of 500 mv or more.

TUNERS

FM-AM tuners (without multiplex). Connect the cable from the FM section to one of the TUNER inputs of the amplifier. Connect the cable from the AM section to the remaining TUNER input.

FM-AM tuners with multiplex. Connect the two output cables from the FM section of the tuner or multiplex adapter to their respective TUNER input jacks at the amplifier. Connect the cable from the AM section of the tuner to one of the AUX input jacks.

TAPE EQUIPMENT

Tape transport (without preamplifier). For stereo transports, connect the output cables to each of the TAPE input jacks of the amplifier. For monophonic transports, connect the single cable to either of the TAPE input jacks of the amplifier.

Tape deck with preamplifier. Connect the output cables from the tape deck to the AUX 1 or AUX 2 input jacks of the amplifier. To make tape recordings, connect the REC jacks of the amplifier to the high level (aux) input jacks of the tape deck. Do not use the microphone inputs of the tape deck. The signal at the REC jacks is not influenced by the volume or tone control settings of the amplifier.

AC POWER RECEPTACLES

On the rear of the amplifier are two AC power receptacles. The power for these receptacles is controlled by the POWER OFF switch at the front of the amplifier.

SPEAKERS

Two Speaker System (stereo or monophonic). For 4, 8, or 16 ohm speakers. Connect the wires from the left speaker to the LEFT OUTPUT strip. Connect the right speaker wires to the RIGHT SPEAKER strip.

Center or Extension Speaker. An additional speaker may be connected to the amplifier as shown in Figure 16. This speaker can serve as a center speaker to fill in "the hole in the middle" or as an extension speaker to provide monophonic reproduction in another room. See **SPEAKER PLACEMENT** for more information on this subject.

CAUTION

Do NOT Set the amplifier on a metal surface where the outer shell of any of the power transistors can short to one another or to the chassis. If the unit is placed on a flat metal surface the feet will provide adequate clearance for the power transistors.

OPERATING THE AMPLIFIER

☐ Connect the speakers and all program source equipment to the amplifier.

☐ Connect the line cords of the system components into suitable power outlets. The two receptacles on the rear of the amplifier may be used for this purpose. Be sure the POWER switch on the amplifier is in the OFF position.

CAUTION: NEVER TOUCH ANY OF THE WIRING WHILE POWER IS BEING APPLIED TO THE AMPLIFIER.

☐ Turn the VOLUME control of the amplifier fully counterclockwise. Apply power to the amplifier and the system component that you wish to hear.

☐ Rotate the SELECTOR to the signal source that is to be reproduced.

☐ Place the MON-STEREO switch in STEREO if you are listening to stereophonic material, or MON if you are listening to monophonic material.

☐ Adjust the VOLUME, BASS, TREBLE controls for the desired volume and tone.

☐ Adjust the BALANCE control for the most pleasing stereo effect.

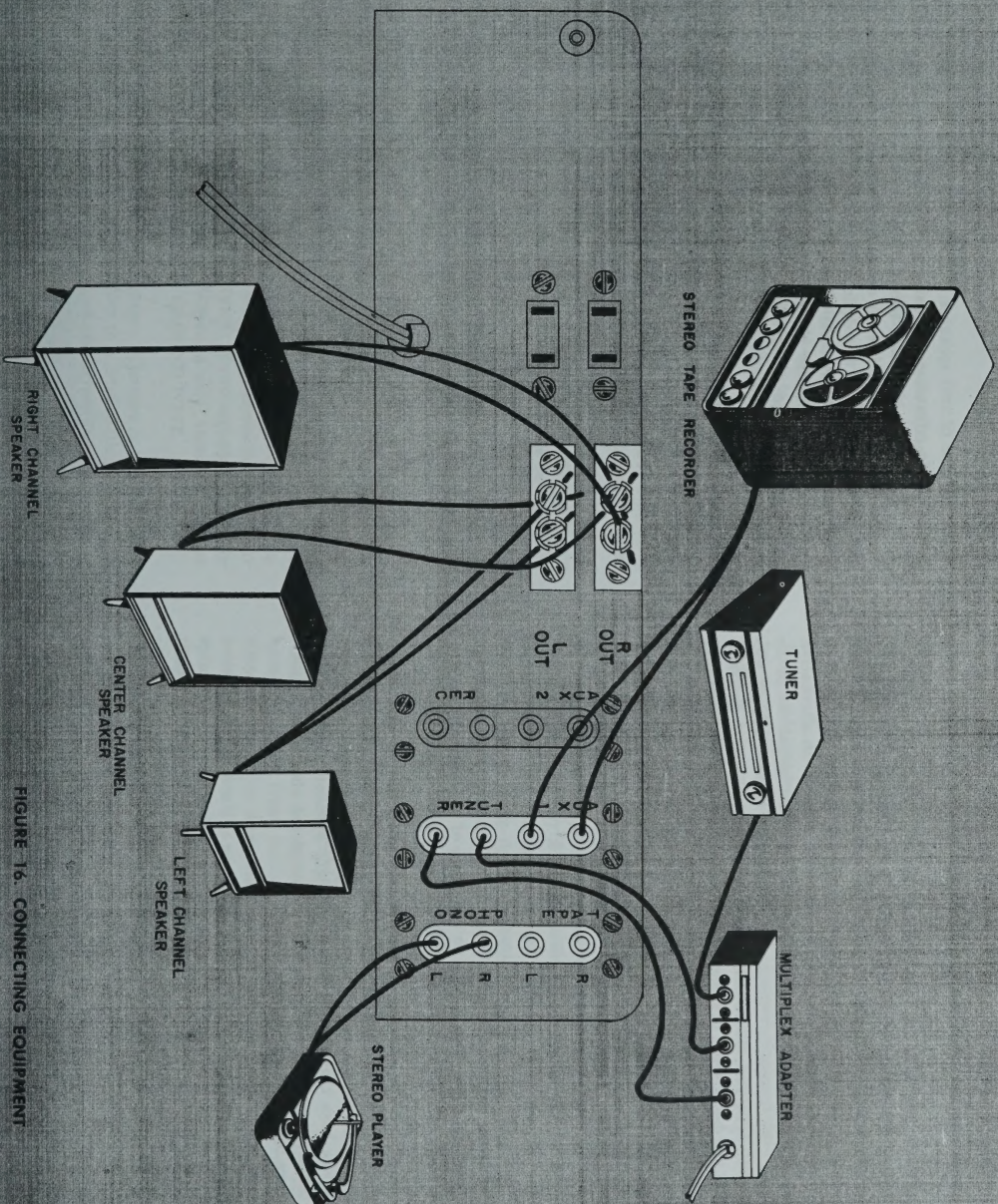


FIGURE 16. CONNECTING EQUIPMENT

SPEAKERS

Good stereo reproduction requires two matched speaker systems properly oriented with respect to the listener. If you can't use identical speakers the next best thing is to use speakers that sound alike except in the low bass region. The reason for this exception is that the sense of direction (the primary reason for stereo) is lost in the very low bass regions. Thus, if you already own a large and expensive speaker system and space or budget doesn't warrant duplicating this system, there is an alternative. Choose a second speaker which sounds most like your original one in the middle and high frequency regions. If your original speaker system was of the 3-way type you can usually obtain a duplicate tweeter and mid-range unit and house them in a much smaller cabinet along with a smaller woofer or bass speaker.

PHASING THE SPEAKERS

For the best bass reproduction, the left and right speakers should be connected "in phase"; that is the speaker cones must move in and out together when reproducing bass tones. To check for correct phasing: Move the left and right speakers as close together as possible. Play some music which is rich in bass tones through your system. Set the MONO/STEREO switch in the MONO position. Turn the BASS control up to emphasize the bass tones. Listen to the depth of the bass for a while then turn the amplifier POWER OFF. Reverse the wires connected to the right speaker system only.

Turn the power on and listen to the depth of the bass. If the bass is more pronounced, your speakers are now correctly phased. If, however, you hear less bass than before, move the right speaker wires back to their original connection. When you have completed this check, move the speakers back to their proper positions.

SPEAKER PLACEMENT

Figure 17 indicates the optimum relationship between the listener and the speakers. The recommended 40 degree angle is not critical. Just try to keep the speakers separated by about $\frac{1}{2}$ to $\frac{3}{4}$ of the distance between the listener and the speakers.

Experiment with the placement of your speakers because every room has its own acoustical properties and every one has his own decorating problems.

CENTER SPEAKERS

While the use of two speakers is basic to any stereo system there are some definite advantages to using a third center speaker. Two-speaker systems are often characterized by the effect of sound coming from two distinct sources. This is fine for stereo demonstration type material where the "ping-pong" effect was desired by the recording people. If you want a smoother diffusion of sound from one side to the other a center speaker is recommended. Another benefit of this additional speaker is the preservation of the stereo effect over a larger portion of the room. This in turn allows greater freedom in arranging your seating furniture.

The center speaker, when connected as shown in Figure 16, reproduces the difference between the left and right channels at a somewhat lower level than the flanking units. Because the difference signal normally has little bass content the requirements for a center speaker are the same as those mentioned for a second inexpensive flanking speaker.

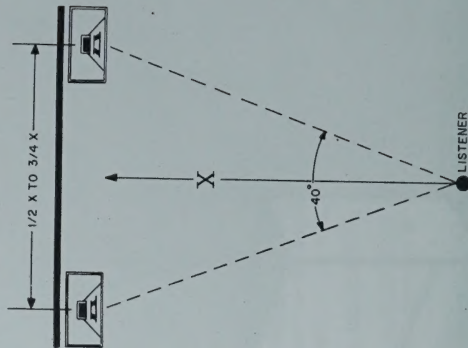


FIGURE 17. SPEAKER PLACEMENT.

PROBLEMS YOU MAY ENCOUNTER WITH YOUR SYSTEM

HUM

Sometimes hum is picked up by a stereo system even though each unit in the system is relatively hum free. Hum can usually be eliminated by taking one or more of the following steps:

1. Remove external hum sources. Fluorescent lamps and power equipment are sources of hum which can be picked up by your system. Such electrical appliances should not be placed too close to your music system. Remove any suspected appliances and note if the hum level decreases.
2. Reverse the position of each line cord plug in the socket, one at a time, to find the position which results in least hum.

DISCONNECT ALL UNITS FROM THE POWER LINE BEFORE TRYING THE FOLLOWING STEPS:

3. Check component placement. To minimize hum, magnetic record player cartridges should be at least 1 foot away from amplifier or tuner power transformers. Power line cords should never be close to the interconnecting audio cables.
4. Check interconnecting shielded cables. Be sure the shield braid or spiral shield is properly soldered to the outside of the plug and that each is firmly seated all the way in the jack.
5. Twist together the two audio cables from your record player before you connect them to your amplifier.
6. Connect a ground wire (#18 wire or heavier) between the motor frame of your record player and the GROUND POST of your amplifier. Many record players have ground or "earth" terminals provided for this purpose. See Figure 18. In the same way, connect the motor frame of your tape recorder to the amplifier GROUND POST. If two separate tuners are used, connect the two chassis with a single ground wire; then connect just one of the tuner chassis to the amplifier GROUND POST.
7. Use a true earth ground if hum persists. Connect a ground cable from the GROUND POST of your amplifier to a true earth ground such as a cold water or radiator pipe or a copper rod driven into the earth.

LOSS OF STEREO EFFECT

First check each channel, one at a time by turning the BALANCE control one way then the other. If both channels are operating but no separation is obtained check for the following.

1. Incorrect speaker placement. See Speakers.
2. Record players. Cartridge defective or incorrectly wired. Cartridge not mounted correctly. Distortion and loss of separation result if the stylus is not perpendicular to the record. Check this by placing a small mirror on the turntable. Set the stylus on the mirror gently and look at the reflection in the mirror from two sides. If the stylus and its reflection are not in line the cartridge is tilted in the arm or the arm is improperly mounted.

Stylus Pressure too high. Stylus pressure above the recommended value distorts the stylus suspension and increases record wear. Check with a stylus pressure gauge and, if too high, reduce it to the minimum needed for good tracking.

Tape Player. Improper head alignment. See manufacturers instructions for checkout.

Stereo Multiplex FM. Be sure station is broadcasting stereo. Try other stations if possible. Be sure tuner is accurately tuned in, since separation can be lost by only a slight mistuning in most tuners.

ACOUSTIC FEEDBACK

Rumble and squeal are often caused by acoustic feedback, the return of sound vibration from the speakers back into the record player. The simplest cure is to move each speaker cabinet away from other components. Sometimes it is necessary to place a foam rubber pad under each speaker enclosure and move the enclosures away from the wall to be sure that vibrations from the speakers do not travel along the wall or floor to other components. If speakers must be mounted in the same cabinet as other components, the cabinet should be solidly built of heavy wood and the speaker compartments should be padded with sound absorbing material.

RECORD AND STYLUS CARE

To keep stereo records in good condition, they should be treated with the care they deserve.

1. Stylus (needle) pressure should be kept to the minimum needed for good tracking. Follow the cartridge manufacturer's recommendations for stylus pressure. An inexpensive stylus pressure gauge will allow you to check the needle pressure from time to time and will prove to be a good investment.
2. Keep your records clean. Dust is a destructive abrasive and causes wear of both stylus and record grooves. Clean records often with a soft sponge moistened with clear, cold water.
3. Brush the stylus often with a soft, camel's hair brush. Considerable distortion will result if the stylus is allowed to accumulate fuzz. NEVER RUB YOUR FINGER AGAINST THE STYLUS—Stylus alignment may be distorted.
4. Change stylus as needed. Although diamonds last much longer than sapphire tips, no stylus stays in good condition forever.

STEREO TAPES

Stereo tapes are an increasingly popular program source. The tapes require no special care other than avoiding extremes of temperature and humidity. However, routine care of the tape heads will insure high quality reproduction, play after play. Routine care includes cleaning the tape heads with tape-head cleaner and demagnetizing the heads. Some enthusiasts recommend cleaning heads after 10 hours of use, demagnetizing after 50 hours.

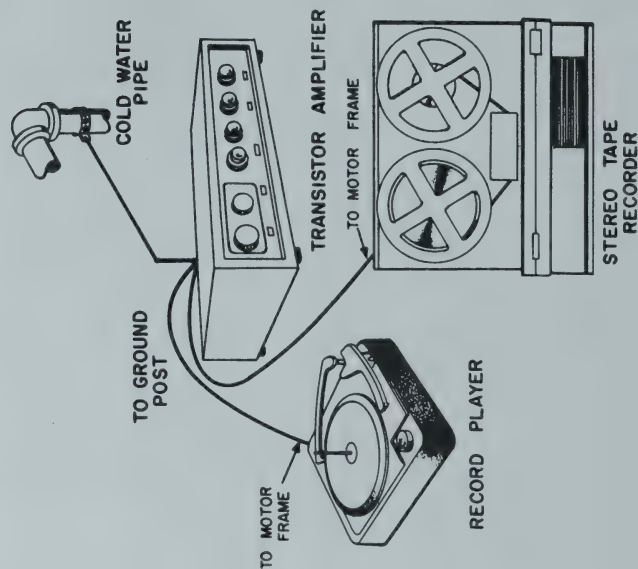


FIGURE 18. USE OF GROUND WIRE

HOW STEREO DIFFERS FROM MONOPHONIC HIGH FIDELITY

Let there be no mistake, stereo is high fidelity! But stereo adds the elements of depth and direction to the faithful reproduction systems that have evolved since the LP record came into existence. Since most people have listening rooms that are a mere fraction of the size of the average auditorium, monophonic reproduction in the home is limited in depth. Stereophonic reproduction can put that fullness of sound, which is usually only experienced in a large reverberant hall, into your living room. Furthermore a good stereo system can make you forget that the music is coming from a couple of "boxes".

Here is a list of the requirements for any high quality music system.

1. **LOW DISTORTION.** Any departure from the original sound is a form of distortion. There are several distinct types of distortion; among these are:

Frequency Distortion or the ability of the system to reproduce equally all tone frequencies from deepest bass to highest treble. Frequency response specifications give the amount of frequency distortion in terms of db deviation (volume) over a given band of frequencies.

Harmonic Distortion where new tones, or frequencies which are multiples of frequencies in the original sound, appear in the output of the system. For example: a strong 300 cycle note is in the music. The reproduction sound has this same 300 cycle note but also some 600 cycle and 900 cycle output. The 600 and 900 cycle tones are harmonic distortion. This harmonic distortion should not be confused with the natural harmonic content of music which gives each instrument its characteristic timbre.

Intermodulation Distortion is usually the most offensive to the

listener. This form of distortion exists where the system output contains the sum or difference tones of two original tones. For example: The original music contains a 60 cycle tone and a 2000 cycle tone. Intermodulation distortion is present when the output of the system contains not only 2000 and 60 cycles, but also contains the 2060 (sum) and 1940 (difference) frequencies.

Low Noise. Hum and hissing sounds not present in the original material should not be introduced by the system. This applies only to amplifiers and preamplifiers or electronic portions of the system. However, a poorly constructed speaker enclosure which rattles is also introducing a noise type of distortion into the system.

2. **Wide dynamic range.** This is the ability of the system to reproduce the loudest passage as well as the quietest. Some modern recordings have a dynamic range of almost 60 db. This means the loudest part is one million times as loud as the quietest part.

These requirements are basic to both stereo and monophonic systems. The basis for stereo is the two channel system where every part of the system, from the recording microphones to the speakers, is duplicated. There are left and right microphones, left and right amplifiers and two of everything in the system chain.

Some components are physically one unit but are designed to have two independent functions. Thus the transistor amplifier looks like one amplifier but is really two separate amplifiers on one chassis. The stereo cart-ridge is one unit but is able to keep separate left and right information which it picks up from a stereo record. The stereo record itself, by the nature of its groove, contains two isolated "storehouses" for sound information.

CIRCUIT DESCRIPTION

SEE BLOCK AND SCHEMATIC DIAGRAMS

Your stereo transistor amplifier consists of two identical amplifiers mounted on the same chassis with a common power supply. Since both channels are identical only the left channel circuitry will be explained.

Selector switch, S-1 connects the input jacks to the 1st preamp, TR-1. The signal is then directly coupled to the 2nd preamp, TR-3. At this point, equalization and feed back for the various inputs is introduced. C-5, C-6, and R-19 comprise the equalization network for the phono input. R-20 and C-7 provide equalization for the tape input. Components C-4 and R-18 form a feed back loop for the high gain inputs (Tuner and Aux).

The output of TR-3 goes through the volume and tone controls to the base of the tone amplifier, TR-5. Tone controls are the feed back type. The output of TR-5 is further amplified by the predriver and driver stages TR-7 and TR-9, to the power required to drive the output transistors. Transformer T-2 provides phase inversion for push-pull operation of the output transistors, TR-11 and TR-12.

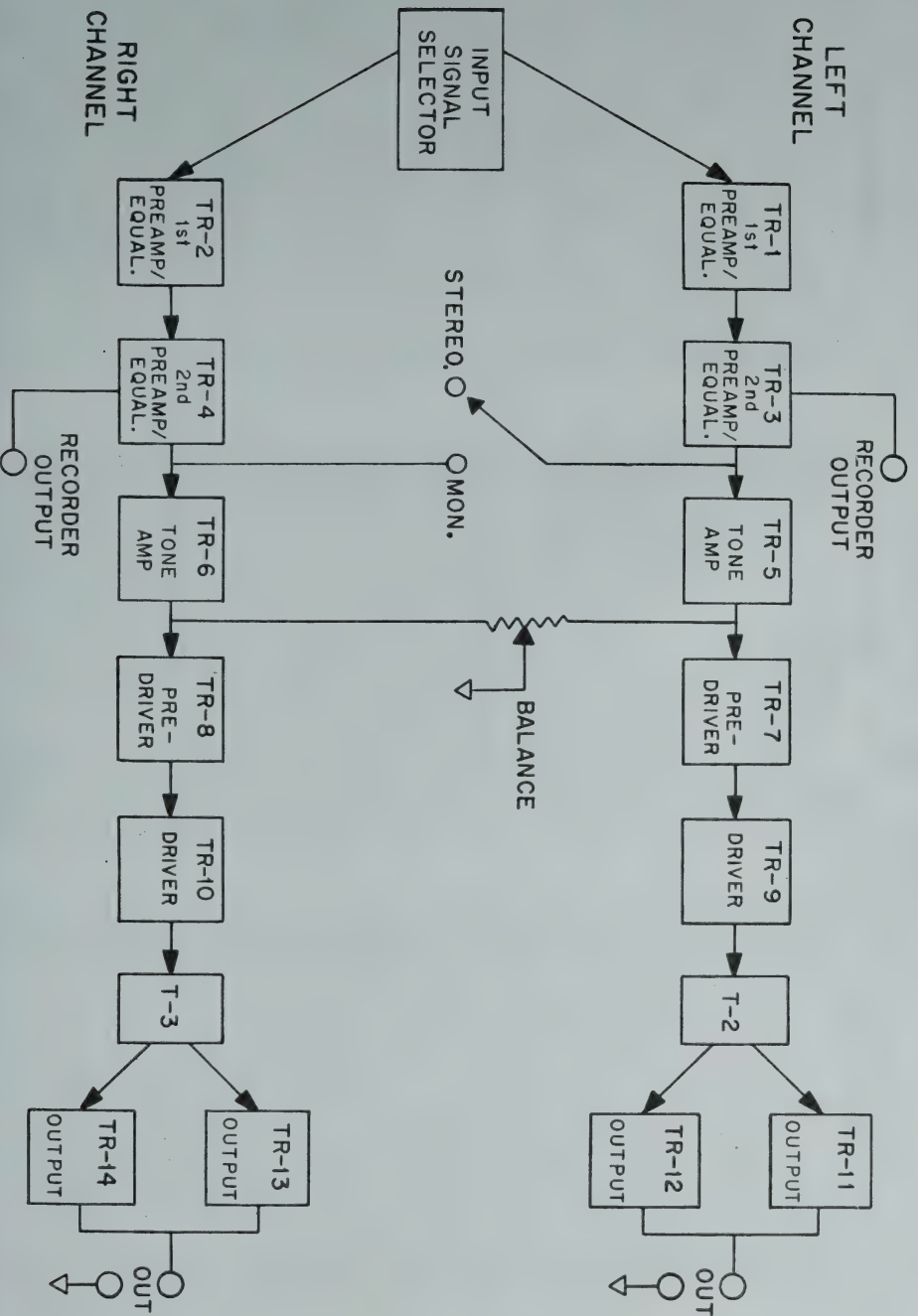
Power transistors TR-11 and TR-12 operate in a single-ended push-pull transformerless circuit. The transistors are operated modified class B. R-63 and R-64 provide bias voltage for TR-11 while R-65 and R-66 provide bias voltage for TR-12. Lamps 1-1A and 1-1B provide DC stabilization, circuit balance and two-way overload protection. Both transistors are connected in common emitter circuits and though they are in series across the split power supply they are in parallel across the single-ended load. As a result of this the output impedance of the stage is very low (2.2 ohms). The lamps have been carefully chosen for their positive tempera-

ture-coefficient characteristics. Since the lamps are in the emitter circuits they provide excellent thermal runaway protection. Any tendency for the collector currents to increase is corrected by an increase in the resistance of the filaments in the lamps. This action also compensates for the slight difference that is found between the characteristics of the two transistors. Should a speaker load become shorted the output transistors are protected from excessive dissipation by the lamps; they will light up and change the bias on the output transistors. The lamps also serve as fuses. In the unlikely event an output transistor becomes shorted the lamp will immediately burn out. This keeps the full supply voltage from being applied across the speaker voice coil.

MON-STEREO switch. When this switch is in the MON position, signals from the left channel are connected to the tone amplifier of the right channel. From this point on, the signal from the left channel is reproduced by both channels. This applies to signals from the right channel inputs also. In the STEREO position, this interconnection between channels is removed causing each channel to reproduce the signals from its inputs only.

BALANCE control. With this control in its center position, an equal resistance to ground is presented to the signal in each channel. As the control is rotated to the left the shunt resistance in the left channel increases, while the shunt resistance in the right channel decreases. This causes the right channel signal to decrease while the left channel signal remains at the same level.

The Power Supply consists of separate positive and negative 23-volt sources. Use of silicon diodes provides excellent inherent regulation.



BLOCK DIAGRAM

PARTS LIST

CAPACITORS

All capacitors are electrolytics unless otherwise specified.

All capacitors are electrolytics unless otherwise specified.		
Symbol Number	Description	Part Number
C-1	50 μ f, 10 volts	221500
C-2	50 μ f, 10 volts	221500
C-3	5 μ f, 12 volts	291007
C-4	2 μ f, 10 volts	225453
C-5	.05 μ f, disc	278051
C-6	.01 μ f, disc	276015
C-7	.02 μ f, disc	276025
C-8	50 μ f, 10 volts	221500
C-9	5 μ f, 12 volts	291007
C-10	50 μ f, 10 volts	221500
C-11	2 μ f, 10 volts	225453
C-12	.05 μ f, disc	278051
C-13	.01 μ f, disc	276015
C-14	.02 μ f, disc	276025
C-15	.0025 μ f, disc	277257
C-16	2 μ f, 10 volts	225453
C-17	10 μ f, 15 volts	221106
C-18	.0025 μ f, disc	277257
C-19	2 μ f, 10 volts	225453
C-20	10 μ f, 15 volts	221106
C-21	.05 μ f, disc	278051
C-22	.05 μ f, disc	278051
C-23	10 μ f, 15 volts	221106
C-24	.02 μ f, disc	276025
C-25	10 μ f, 15 volts	221106
C-26	.02 μ f, disc	276025
C-27	10 μ f, 15 volts	221106
C-28	.05 μ f, disc	278051
C-29	150 μ f, disc	276158
C-30	10 μ f, 15 volts	221106
C-31	.05 μ f, disc	278051
C-32	150 μ f, disc	276158
C-33	1000-1000 μ f, 25 volts	211204
C-34	1000-1000 μ f, 25 volts	211204
C-35	250 μ f, 15 volts	225451
C-36	200 μ f, 12 volts	225452
C-37	1000-1000 μ f, 25 volts	211204
C-38	5800 μ f, disc	276687
C-39	6800 μ f, disc	276687

RESISTORS

Symbol	Description	Part Number
R-1	470K	301472
R-2	4.7K	301472
R-3	390K	301394
R-4	390K	301394
R-5	4.7K	301472
R-6	470K	301474
R-7	4.7K	301472
R-8	390K	301394
R-9	390K	301394
R-10	4.7K	301472
R-11	1K	301102
R-12	1K	301102
R-13	20K, 5%	302203
R-14	8.2K	301822
R-15	36K, 5%	302363
R-16	47Ω	301470
R-17	1.3K, 5%	302132
R-18	8.2K	301822
R-19	6.8K	301682
R-20	33K	301332
R-21	20K, 5%	302203
R-22	8.2K	301822
R-23	36K, 5%	302363
R-24	47Ω	301470
R-25	1.3K, 5%	302132
R-26	8.2K	301822
R-27	6.8K	301682
R-28	3.3K	301332
R-29	20K 4 section control	420046
R-30	47K	301472
R-31	4.7K	301472
R-32	4.7K	301472
R-33	50K 2 section control	392165
R-34	50K 2 section control	392165
R-35	4.7K	301472
R-36	4.7K	301472
R-37	4.7K	301472
R-38	270K	301472
R-39	5.1K, 5%	301274
R-40	6.8K	302512
R-41	6.8K	301682

RESISTORS (Cont.)

Symbol	Description	Part Number
R-42	270K	301274
R-43	51K, 5%	302512
R-44	100K	301101
R-45	390K	301391
R-46	390K	301391
R-47	390K	301391
R-48	68K	301688
R-49	68K	301683
R-50	1K	301102
R-51	1K	301102
R-52	330K	301331
R-53	330K	301331
R-54	20K control	390172
R-55	4.7K	301472
R-56	20K, 5%	302203
R-57	82K	301820
R-58	2.7K	301272
R-59	2.7K	301272
R-60	4.7K	301472
R-61	20K, 5%	302203
R-62	82K	301820
R-63	1K 1 watt	301820
R-64	2.2K, 5%	304102
R-65	1K 1 watt	304102
R-66	2.2K, 5%	312020
R-67	1K 1 watt	304102
R-68	2.2K, 5%	312020
R-69	1K 1 watt	304102
R-70	2.2K, 5%	312020

SWITCHES

S-1	Selector switch, 2 wafer	437069
S-2	Power switch	431201
S-3	Mon/Stereo switch	431200

TERMINAL STRIPS

TS-1	2-terminal	440203
TS-2	4-terminal	440402
TS-3	4-terminal	440402
TS-4	2-terminal	440201
TS-5	2-terminal	440201

PARTS LIST

TERMINAL STRIPS (Cont.)

Symbol Number	Description	Part Number
TS-6	2-terminal	440201
TS-7	2-terminal	440201
TS-8	2-screw	441201
TS-9	4-jack strip	502240
TS-10	4-jack strip	502240
TS-11	4-jack strip	502240
TS-12	2-screw	441201

TRANSFORMERS

T-1	Power transformer	107257
T-2	Driver transformer	103300
T-3	Driver transformer	103300

TRANSISTORS AND DIODES

CR-1	Silicon diode	622202
CR-2	Silicon diode	622202
CR-3	Silicon diode	622202
CR-4	Silicon diode	622202
TR-1 to TR-4	2N581, black color dot	660060
TR-5 to TR-8	2N581, red color dot	660059
TR-9	660030	660030
TR-10	660030	660030
TR-11 to TR-14	Power output	660031

MISCELLANEOUS

Description	Quantity	Part Number
Bushing, line cord	1	880031
Board, printed circuit	1	820153
Board, terminal	1	442962
Chassis	1	463489
Feet, plastic	4	880016
Panel, front	1	485051
Plate, bottom	1	463493
Fuse, 1 1/2 amp	1	491012
Gaskeets, transistor	4	811013
Heat Sink	2	480022
Insulators, jack	3	850060
Jewel, pilot lamp	1	641003
Knob, 1"	2	761006

MISCELLANEOUS (Cont.)

Description	Quantity	Part Number
Knob, 1 1/8"	3	763512
Label, transistor mounting	1	750400
Lamp, filament (I-1 and I-2)	2	640015
Lamp, pilot	1	640014
Line cord	1	802012
Receptacle, fuse	1	492101
Receptacle, AC power	2	502232
Spacer, ceramic	2	940004
Spacer, steel 1"	2	480017
Spacer, steel 1/4"	4	480011
Sockets, transistor (power)	4	501020
Sockets, transistor	10	501130
Socket, pilot lamp	1	501730

WIRE, SOLDER AND TUBING

2" red	13	809002
2 1/4" white/yellow	2	804090
2 1/2" white/green	10	804094
3" orange	11	809003
3 1/2" white/black	1	804093
4" yellow	4	809004
5" green	3	809005
6" blue	6	809006
7" violet	3	809007
8" gray	4	809008
9" white	4	809009
10" brown	3	809010
10" white/orange	1	809042
12" white/red	1	804088
17" white/violet	1	809065
36" thin bare wire	1	806036
12" heavy bare wire	1	806612
12" red tubing	1	812007
26" black tubing	1	812019
10" red shielded cable	1	803101
10" gray shielded cable	1	809066
28" two conductor shielded cable	1	809067
10" Solder	1	930005

HARDWARE

Description	Quantity	Part Number
Screws		
8-32 x 1/2"	1	560446
8-32 x 7/16" set screw	2	563445
8-32 x 1/4" set screw	3	569001
6-32 x 3/8"	36	560344
6-32 x 1/2" flister head	8	563344
6-32 x 3/16"	4	560341
4-40 x 3/8" flat head	4	569758
4-40 x 5/16"	16	560223
#6 x 3/8" self tapping	8	563390
#6 x 1/2" self tapping	4	562398
#4 x 1/4" self tapping	3	562294

Nuts

8-32	10	570540
8-32 knurled	1	572441
8-32	1	570440
6-32	34	570340
4-40	20	570221
clip nut	1	531009

Washers

#8 lockwasher	1	562400
#6 lockwasher	36	562300
#6 fiber washer	6	560300
#4 lockwasher	20	562200
#6 lockwasher	5	562700
flat washer	5	560702

SUGGESTED ACCESSORIES

Stock Number	Description	*Price
83 YX 017	Metal case	\$1.95
83 YX 016	Wood cabinet (walnut)	8.95

TOOLS NEEDED FOR CONSTRUCTION

46 N 552	Soldering iron, pencil type	\$5.78
50 N 132	Longnose pliers, 6"	2.10
50 N 133	Diagonal cutters, 5"	1.84
45 N 378	Screwdriver 6" blade	.64

* Subject to change.

SERVICE HINTS

If the amplifier does not work properly carefully recheck all wiring. Look for poor solder connections and possible accidental shorts between terminals that are not connected. Because of the high currents involved in this amplifier it is extremely important that all connections be well soldered. Cold solder joints (joints in which the solder has not flowed throughout the wires and terminals) can cause the unit to oscillate and hum. If any connection looks doubtful reheat it and add a small amount of fresh solder.

If one or more of the filaments in the lamp I-1 or I-2 should light up, turn the power off immediately and remove the line cord from the AC outlet. Check all wiring to transistor sockets TR-11 through TR-14. Note that lamp I-1 is in the left channel and lamp I-2 is in the right channel.

Do NOT short terminals to ground or to other terminals with a screwdriver or any other metallic tool in an attempt to isolate a trouble. Anytime the $+$ or $-$ 23-volt supplies are shorted to ground, even for an instant, the transistors could be permanently damaged.

Listed below is a table containing the type number and manufacturer of the transistors and equivalents used in this kit. If you find it necessary to replace any of the transistors, this information will be of benefit to you. It should be borne in mind, however, that many of the transistors in your kit were individually selected to render optimum performance in their assigned circuits. Consequently, we recommend that replacement transistors be ordered from Allied Radio by the part numbers we have assigned to them. This will insure continued high quality performance of your amplifier.

Transistors	Manufacturer	Type	Part Number
TR-1 to TR-4	RCA	2N581	660060
TR-5 to TR-8	RCA	2N581	660059
TR-9 & TR-10	Bendix	2N1008B	660030
TR-11 to TR-14	Bendix	2N235A	660031
	TI	2N456A	_____

SERVICE HINTS

Symptom	Procedure	Remedy
Entire amplifier dead. Pilot lamp does not light.	Check Fuse. Check wiring of power switch and T-1.	Replace fuse or Correct wiring.
No sound out of one channel.	Connect a signal source to the defective channel. Place the MON/STEREO switch in MON. If the signal is reproduced by the remaining channel, the trouble lies between the tone control amplifier and output stages of the defective channel. Interchange the transistors between channels, stage by stage, until the defective stage is isolated. If no signal is heard in either channel, the trouble lies between the tone control amplifier and input stages. Interchange the transistors as described above. Measure voltages with a vacuum tube voltmeter.	Replace defective transistor.

CAUTION

Remove the line cord from the AC outlet before changing transistors or connecting test equipment. When changing transistors on the printed circuit board be sure to insert new units properly. Transistors can be plugged in backwards.

NOTE

When testing this amplifier with a signal generator and oscilloscope or distortion analyzer the input circuit must be floated above ground to prevent oscillation. Lack of common grounds between test instruments can also cause the amplifier to oscillate.

CAPACITORS and RESISTORS



CAPACITOR IDENTIFICATION

The capacitors in your kit (named for their capacity for storing electrical energy) may be of several different types. You must choose the correct capacitor for each step, or the kit will not work as designed.

TYPE OR SHAPE. Select by type or shape such as disc, tubular, mylar, mica or electrolytic in a can.

CAPACITY VALUE. Select by capacity value, given in microfarads (μf or mf) or micro-microfarads ($\mu\mu\text{f}$, mmf or pf). Most small values are stated in micro-microfarads such as 10 $\mu\mu\text{f}$ and 270 $\mu\mu\text{f}$. Larger values are given in microfarads as .02 μf and .015 μf .

On some disc capacitors, values may be stated either in μf or $\mu\mu\text{f}$. To change from μf to $\mu\mu\text{f}$, simply move the decimal point to the right 6 places. Here are a few examples of alternate markings:

.0022 μf equals 2200 $\mu\mu\text{f}$
 .01 μf equals 10,000 $\mu\mu\text{f}$
 .0033 μf equals 3300 $\mu\mu\text{f}$

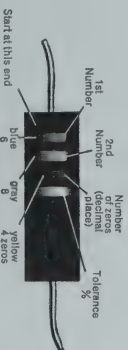
VOLTAGE RATINGS. The capacitor may be marked with the maximum operating voltage, such as 600 v, 500 v, 350 wvdc. Where these are important they will be stated.

TOLERANCE ratings are given in percentages (%). Where these are important they will be stated. Manufacturer's type number such as SK, BIT, SPRAGUE, CRL, Z5F etc. are not used for identification purposes.

RESISTORS

Resistors are used to resist the flow of electricity. For your convenience, the resistors in your kit are supplied carded and labeled by R numbers for ready identification. Variable resistors (controls) and resistors too large to fit on the resistor card are clearly marked with the resistance value, either in ohms (Ω), thousand ohms (K) or million ohms (meg). The electronics color code used for the color bands on the resistors is easy to learn. Numbers 0 through 9 are shown by these colors:

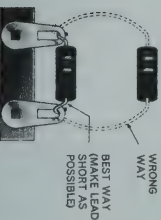
- | | |
|------------|------------|
| 0...black | 5...green |
| 1...brown | 6...blue |
| 2...red | 7...violet |
| 3...orange | 8...gray |
| 4...yellow | 9...white |



To read the value of a resistor, start at the end closest to the color bands. Write down the number for the *first band*, 6 (blue) in the example shown on this page. To the right of 6, write the number for the *second band*, 8 (gray) in our example. The *third band* gives the number of zeros. Since the third band in our example is yellow, write 4 zeros (0000) next to the 68, making the number 680,000 ohms. This is usually given in a short form, 680K, with K standing for a thousand ohms.

The fourth color band shows the tolerance rating, or how closely the resistance value is controlled in manufacture. Silver indicates a tolerance of $\pm 10\%$, gold, $\pm 5\%$.

SPECIAL CASE. For resistors under 10 ohms, the third color band will be silver or gold. If the third band is gold, the resistor is between 1 and 10 ohms so the decimal point goes between the first and second digit. For example, blue, gray, gold is 6.8 ohms. But if the third band is silver, the value is less than 1 ohm, with the decimal point before the first digit. For example, blue, gray, silver is .68 ohms.



MOUNTING RESISTORS AND CAPACITORS

Keep resistor and capacitor leads **SHORT**. Mount the part as shown in the wiring illustrations, then pull the leads all the way through. Cut off excess lead length. Proper soldering techniques are shown on the other side.

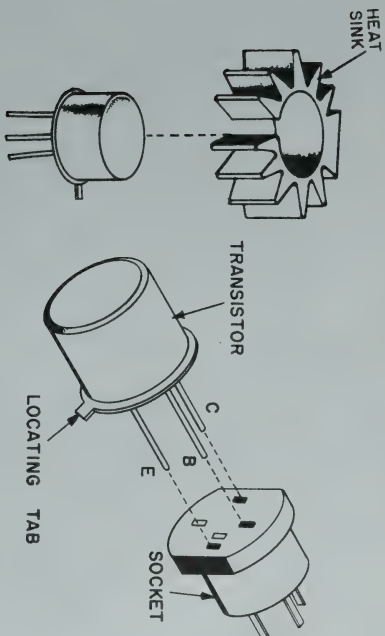


FIGURE 14. TRANSISTOR MOUNTING

SEE FIGURES 14 and 15.

- ☐ Four 2N681 transistors with a black color dot. Cut the leads of each transistor to $\frac{1}{4}$ " long. Insert the leads in the sockets labeled TR-1, TR-2, TR-3 and TR-4. Notice that there are five holes in the transistor sockets, three of which contain the socket pins. Insert the transistor leads in these holes. Note the position of the locating tabs.
- ☐ Four 2N681 transistors with a red color dot. Cut the leads of these transistors to $\frac{1}{4}$ " long. Similarly mount in the sockets labeled TR-5, TR-6, TR-7 and TR-8.
- ☐ Two transistors with part number 660030 stamped on them. Cut the leads to $\frac{1}{4}$ ". Place a heat sink over the top of each transistor as shown in Figure 14. Mount these transistors in the sockets labeled TR-9 and TR-10.

NOTE: TRANSISTORS SHOULD NEVER BE REMOVED FROM OR INSERTED INTO THEIR SOCKETS WHILE POWER IS BEING APPLIED.

- ☐ Transistor mounting label. Remove the paper backing from the label. Mount the label to the top of the power transformer by placing the adhesive side down and pressing into position.

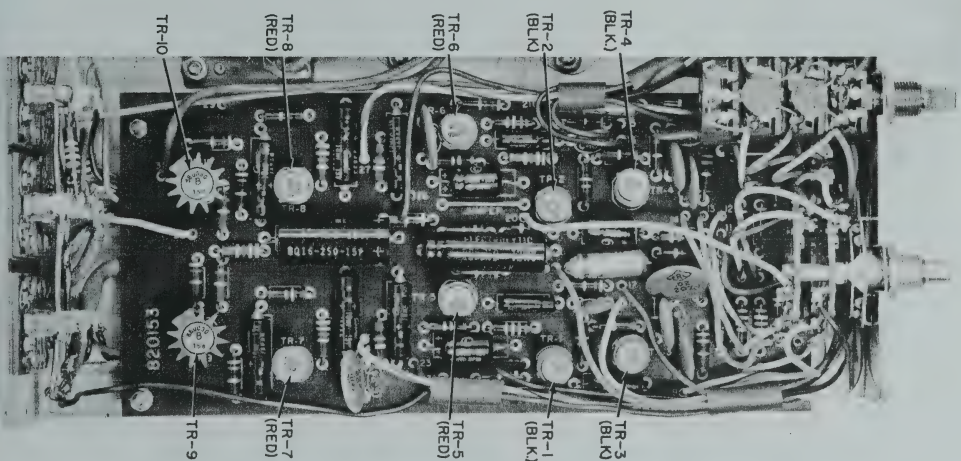
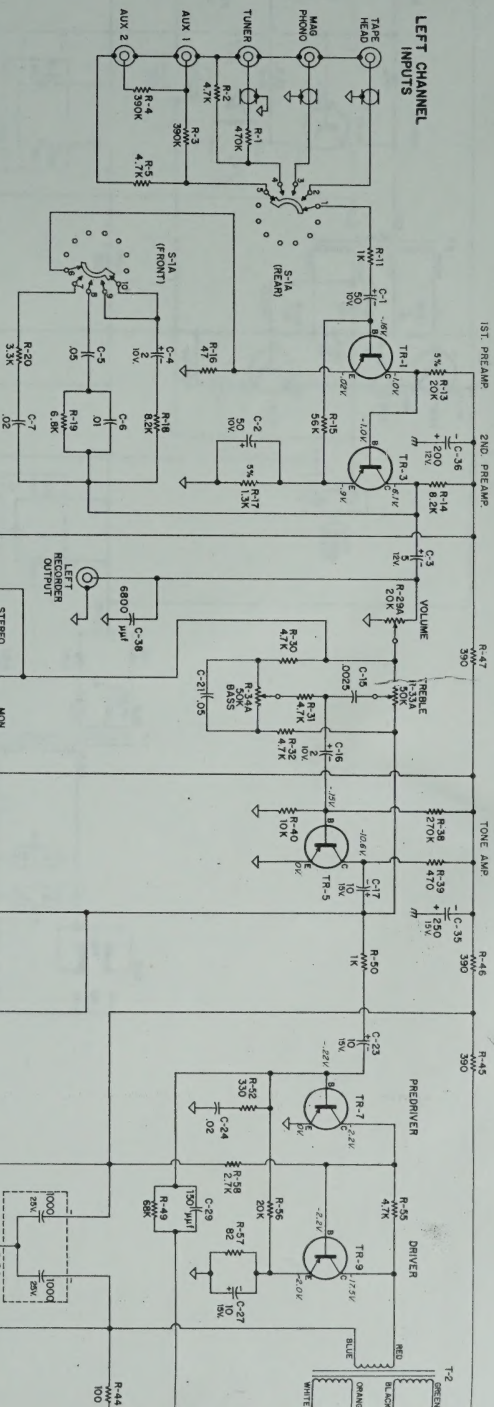


FIGURE 15. TRANSISTOR LOCATION

LEFT CHANNEL

INPUTS



RIGHT CHANNEL

INPUTS

